

Gene name: O1-180

cDNA sequence: 1276 bp

"AAGGCGGGCGAGGCGGGACGCACCCATGTTCCCGGCGAG
 CACGTTCCACCCCTGCCC GCATCCTTATCCGCAGGCCACCAAAGCCGGGGATG
 GCTGGAGGTTCGGAGCCAGGGGCTGCCGACCCGCGCCCCCTCCTTCCTCCCC
 GGCTACAGACAGCTCATGGCCGCGGAGTACGTCGACAGCCACCAGCGGGCAC
 AGCTCATGGCCCTGCTGTGCGGATGGGTCCCCGGTCGGTCAGCAGCCGTGA
 CGCTGCGGTGCAGGTGAACCCGCGCCGCGACGCCTCGGTGCAGTGTTCACTC
 GGGCGCCGCACGCTGCAGCCTGCAGGGTGCCGAGCCAGCCCCGACGCCCCGAT
 CGGGTTCCTGTCAACCCCGTGGCCACGCCGGCGCCGGGAGATCCCCGCGATC
 CTGGCAGACCGTAGCCCCGTTCTCGTCCGTGACCTTCTGTGGCCTCTCCTCCTC
 ACTGGAGGTTTGCGGGAGGCAGGCAGACACCCACGAAGGGAGAGGGGAGCCC
 GGCATCCTCGGGGACCCGCGGAACCGGAGCCGAGAGAGGTGGCCGCGAGGAA
 AGCGGTCCCCCAGCCGCGAAGCGAGGAGGGCGATGTTCAAGGCTGCAGGGCA
 GGCCGGGTGGGAGCAGCAGCCACCACCGGAGGACCGGAACAGTGTGGCGGC
 GATGCAGTCTGAGCCTGGGAGCGAGGAGCCATGTCCTGCCGCAGAGATGGCT
 CAGGACCCCGGTGATTTCGGATGCCCCCTCGAGACCAGGCCTCCCCGCAAAGCAC
 GGAGCAGGACAAGGAGCGCCTGCGTTTCCAGTTCTTAGAGCAGAAGTACGGCT
 ACTATCACTGCAAGGACTGCAAAATCCGGTGGGAGAGCGCCTATGTGTGGTGT
 GTGCAGGGCACCAGTAAGGTGTTACTTCAAACAGTTCTGCCGAGTGTGTGAGAA
 ATCCTACAACCCTTACAGAGTGGAGGACATCACCTGTCAAAGTTGTAAAAGAAC
 TAGATGTGCCTGCCCAGTCAGATTTCCGCCACGTGGACCCTAAACGCCCCCATC
 GGCAAGACTTGTGTGGGAGATGCAAGGACAAACGCCTGTCCTGCGACAGCAC
 CTTCACTTCAAATACATCATTTAGTGAGAGTCGAAAACGTTTCTGCTAGATGG
 GGCTAATGGAATGGACAAGTGAGCTTTCTCCCTCTTACCTCTTCCCTTTCCAA
 ATTCTTCATGACAGACAGTGTTACTTGGATATAAAGCCTGTGAATAAAAGGTAT
 TGCAACACAAAAAAAAAAAAAAAAAAAA"

Figure 1

Amino Acid sequence: 361aa

"MFPASTFHPCPHYPQATKAGDGWRFGARGCRPAPPSFLPGYRQLMAAEYVDS
HORAQLMALLSRMGPRSVSSRDAAVQVNPRRDASVQCSLGRRTLQPAGCRASPDA
RSGSCQPRGHAGAGRSPRSWQTVAPFSSVTFCGLSSSLEVAGGRQTPTKGEKSPA
SSGTREPEPREVAARKAVPQPRSEEGDVQAAGQAGWEQQPPPEDRNSVAAMQSEP
GSEEPCPAAEMAQDPGSDAPRDQASPQSTEQDKERLRFQFLEQKYGYHCKDCK
IRWESAYVWCVQGTSKVYFKQFCRVCEKSYNPHYRVEDITCQCKRTRCACPVFR
HVDPKRPHRQDLGRCKDKRLSCDSTFSFKYII"

Figure 2

01-184 cDNA sequence: 1817bp

GTCACAGCTTTCCCCTGCCCGAATATGGTGATCTGTCTCCATTGTCCAGATCA
 GGATGATTCTTTAGAAGAAGTCACAGAGGAATGCTATTCCCCACCCACCTC
 CAGAACCTGGCAATTCAGAGTCTACTGAGGGATGAGGCCCTTGGCCATTTCTG
 CTCTCACGGACCTGCCCCAGAGTCTGTTCCAGTAATTTTTGAGGAGGCCTTC
 ACTGATGGATATATAGGGATCTTGAAGGCCATGATACCTGTGTGGCCCTTCCC
 ATACCTTTCTTTAGGAAAGCAGATAAATAATTGCAACCTGGAGACTTTGAAG
 GCTATGCTTGAGGGACTAGATATACTGCTTGCACAAAAGGTTCAAACCAGTA
 GGTGCAAACTCAGAGTAATTAATTGGAGAGAAGATGACTTGAAGATATGGGC
 TGGATCCCATGAAGGTGAAGGCTTACCAGATTTTCAAGACAGAGAAGCAGCCA
 ATTGAGAACAGTGCTGGCTGTGAGGTGAAGAAAGAATTGAAGGTGACGACT
 GAAGTCCTTCGCATGAAGGGCAGACTTGATGAATCTACCACATACTTGTTGC
 AGTGGGCCCAGCAGAGAAAAGATTCTATTCTATTCTGTAGAAAGCTACT
 AATTGAAGGCTTAACCAAAGCCTCAGTGATAGAAATCTTCAAACTGTACAC
 GCAGACTGTATACAGGAGCTTATCCTAAGATGTATCTGCATAGAAGAGTTGG
 CTTTTCTTAATCCCTACCTGAAACTGATGAAAAGTCTTTTCACACTCACACTA
 GATCACATCATAGGTACCTTCAGTTTGGGTGATTCTGAAAAGCTTGATGAGG
 AGACAATATTCAGCTTGATTTCTCAACTTCCCACACTCCACTGTCTCCAGAAA
 CTCTATGTAAATGATGTCCCTTTTATAAAAGGCAACCTGAAAGAATACCTCAG
 GTGCCTGAAAAAGCCCTTGGAGACACTTTGCATCAGTAAGTGTGACCTCTCAC
 AGTCAGACTTGGATTGCCTGCCCTATTGCCTGAATATTTGTGAACTCAAACAT
 CTGCATATTAGTGATATATATTTATGTGATTTACTCCTTGAGCCTCTTGTTTT
 CTCCTTGAGAGAGTTGGAGATACCCTGAAAACCCTGGAATTGGATTCATGTT
 GTATAGTGGACTTTTCAGTTCAGTGCCTTGCTGCCTGCCCTAAGCCAATGTTCT
 CACCTCAGAGAGGTCACTTTCTATGATAATGATGTTTCTCTGCCTTTCTTGAA
 AACAACTTCTACACCACACAGCCCTGCTGAGTCAGCTGATCTATGAGTGTTAC
 CCTGCCCCCTCTAGAGTGCTATGATGACAGTGGTGTAATACTAACACACAGATT
 AGAAAGTTTTTGTCTGAGCTTCTGGATATACTGAGAGCCAAAAGACAGCTC
 CATAGTGTCTCCTTTCAAACAACCAAATGCTCTAAATGTGGTGGGTGCTACAT
 TTATGATCGGCATACCCAATGTTGCCGTTTTGTGGAAGTACTATAAGCTTGAT
 TGTGAAACTGAGAAATAGAACTTAGTATTGGGGACTGATGAAATCCTAAGT
 GAATGTCCACTGCTAAATGGAGCATGAAAATGTCAATCACCTAAAAGTCTGA
 GATACACAGGAAAGTCAATAACTTCCTCTGAGCTGGTGAATGGATGTTGCAT
 CTGTAGAAAGTATCAAGCACTTGTAGTTTGAATGTGTTACAATAGAAGCACC
 ATTTTATGAGACTGGCCCAATCTGTTGACTGCATACAATAAATCTGTTGACTT
 ATTAAATTTTTAAAAA

Figure 3

O1-184 amino acid sequence: 426 amino acids

MVICLHCPDQDDSL EEVTEECYSPPTLQNLAIQSLLRDEALAI SALTDL PQSLFP
VIFEEAFTDGYIGILKAMIPVWPFPYLSLGKQINNCNLETLKAMLEGLDILLAQKV
QTSRCKLRVINWREDDLKIWAGSHEGEGLPDFRTEKQPIENSAGCEVKKELKV
TTEVLRMKGRLDDESTTYLLQWAQQRKDSIHLFCRKLLIEGLTKASVIEIFKTVHA
DCIQELILRCICIEELAF LN PYL KLMKSLFTLTLDHIIGTFSLGDSEKLDEETIFSLIS
QLPTLHCLQKLYVNDV PFIKGNLKEYLRCLKKPLETLCISNCDLSQSDLDCLPYC
LNICELKHLHISDIYLODLLLEPLGFLLERVGD TLK TLELDSCCIVDFQFSALLPAL
SQCSHLREVT FYDNDVSLPFLKTTSTPHSPAESADL

Figure 4

Gene name: O1-236

cDNA sequence: 1019bp

“GCCATATTGAGGACCTGCAGTAGAGGTGGAACCCATGACTGGCAGCGCAAAC
ACAGTGATAACAGCTGAGCTCCAAGCAAGGACCCAGGACCTTGCCTCACCACA
GACATAATCTTTCCCCACAACACCTCCACCAAGCCGCCCTGTAAATCGACATGA
GTCGCCACAGCACCCAGCAGCGTGACCGAAACCACAGCAAAAAACATGCTCTGG
GGTAGTGAACCTCAATCAGGAAAAGCAGACTTGCACCTTTAGAGGCCAAGGCGA
GAAGAAGGACAGCTGTAAACTCTTGCTCAGCACGATCTGCCTGGGGGAGAAAG
CCAAAGAGGAGGTGAACCGTGTGGAAGTCCTCTCCCAGGAAGGCAGAAAACC
ACCAATCACTATTGCTACGCTGAAGGCATCAGTCCTGCCCATGGTCACTGTGTC
AGGTATAGAGCTTTCTCCTCCAGTAACTTTTCGGCTCAGGACTGGCTCAGGACC
TGTGTTCCCTCAGTGGCCTGGAATGTTATGAGACTTCGGACCTGACCTGGGAAG
ATGACGAGGAAGAGGAGGAAGAGGAGGAGGAAGAGGATGAAGATGAGGATG
CAGATATATCGCTAGAGGAGATACCTGTCAAACAAGTCAAAAGGGTGGCTCCC
CAGAAGCAGATGAGCATAGCAAAGAAAAAGAAGGTGGAAAAAGAAGAGGATG
AAACAGTAGTGAGGCCCCAGCCCTCAGGACAAGAGTCCCTGGAAGAAGGAGAA
ATCTACACCCAGAGCAAAGAAGCCAGTGACCAAGAAATGACCTCATCTTAGCAT
CTTCTGCGTCCAAGGCAGGATGTCCAGCAGCTGTGTTTTGGTGCAGGTGTCCA
GCCCCACCACCCTAGTCTGAATGTAATAAGGTGGTGTGGCTGTAACCCTGTAAC
CCAGCCCTCCAGTTTCCGGAGGTTTTTGGTGAAGAGCCCCCAGCAAGTTCGCC
TAGGGCCACAATAAAATTTGCATGATCAGGAAAAAAAAAAAAAAAAAAAAAAAAA
AAAAAAAAAAAA”

Figure 5

Amino Acid sequence: 207aa

“MSRHSTSSVTETTAKNMLWGSELNQEKQTCTFRGQGEKKDSCKLLLSTICLGEK
AKEEVNRVEVLSQEGRKPPITIALKASVLPMTVSGIELSPVTFRLRTGSGPVFLS
GLECYETSDLTWEDDEEEEEEEEEDEDEDADISLEEIPVKQVKRVAPQKQMSIAKK
KKVEKEEDETDDRPSQDKSPWKKEKSTPRAKKPVTCK”

Figure 6

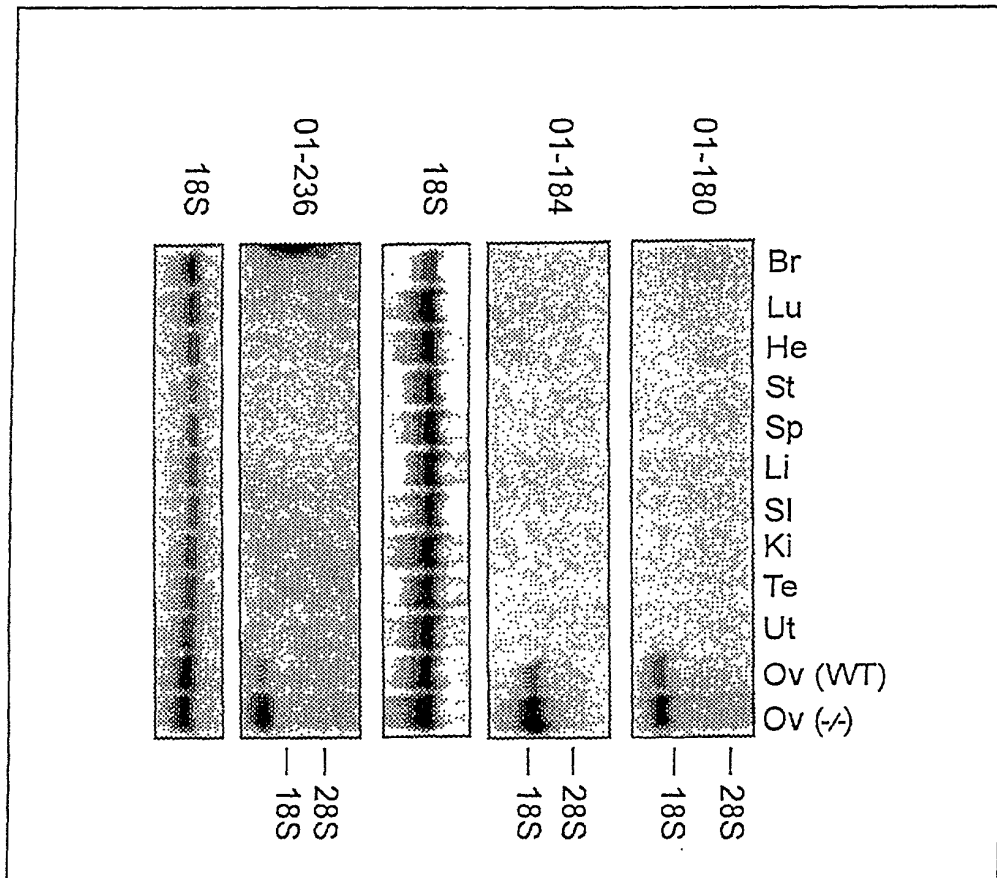


Figure 7

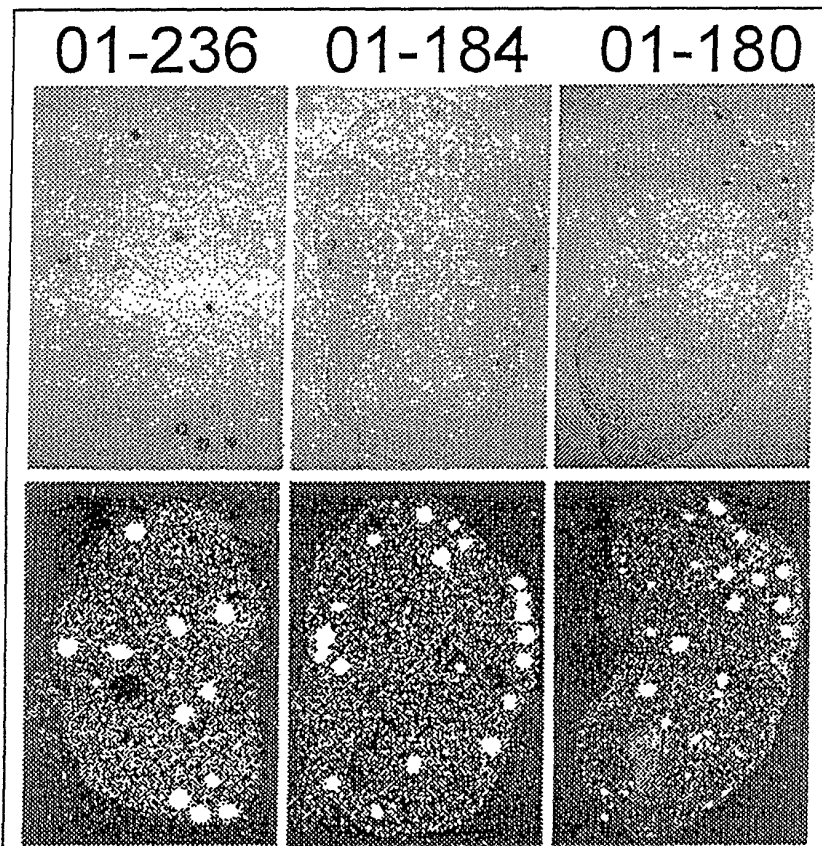


Figure 8

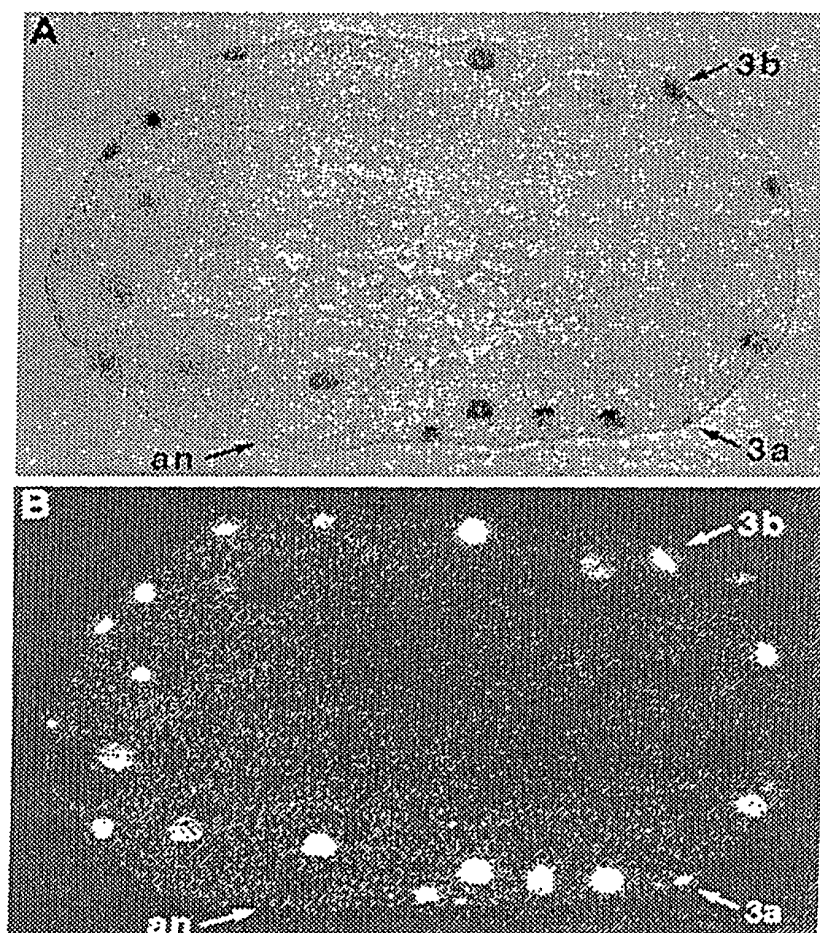


Figure 9

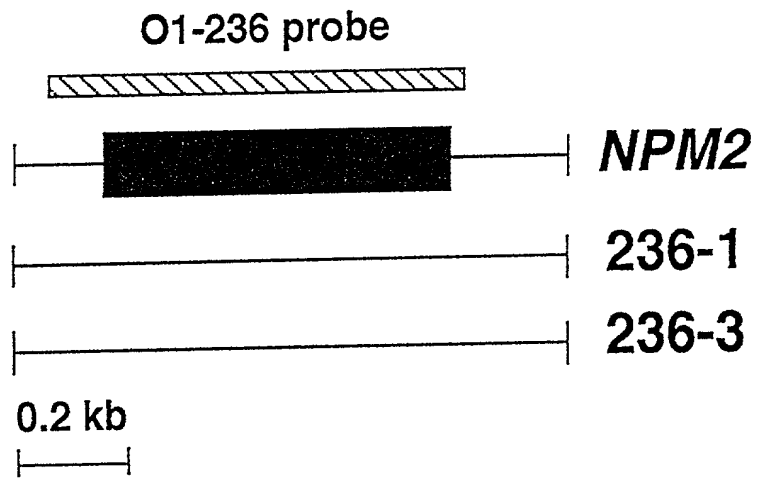


Figure 10

Figure 11

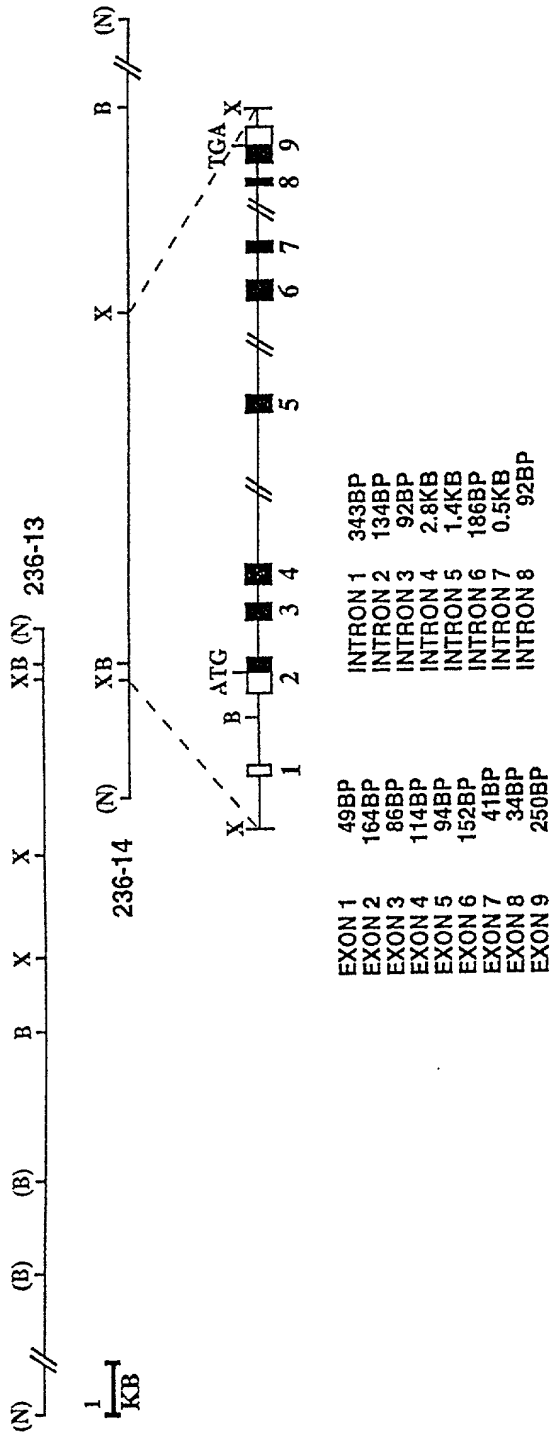


Figure 12

Mouse *Npm2* Gene Sequences

acagcagaggtgatgctcagaaatcaagttttaacagagggccaggtg

cttctagagtaggaggggattgcacacctccccacccctcctcttc

ccaggcttcttaacagcctgctgtggaagctgacccttagatggagc

cctgaaGCCATATTGAGGACCTGCAGTAGAGGTGGAACCCATGACTGG

CAGCGCAgtaagcttgagcagg... intron 1= 343bp

...ctttgcattactcagAACACAGTGATAACAGCTGAGCTCCAAGCA

AGGACCCAGGACCTTGCCTCACCACAGACATAATCTTTCCCCACAACA

CCTCCACCAAGCCGCCCTGTAAATCGAC ATG AGT CGC CAC AGC

1

M S R H S

ACC AGC AGC GTG ACC GAA ACC ACA GCA AAA AAC ATG

6

T S S V T E T T A K N M

CTC TGG Ggtaagggctaaggct... intron 2 = 134bp

18

L W

...gtcttcgctgtgcagGT AGT GAA CTC AAT CAG GAA AAG

20

G S E L N Q E K

CAG ACT TGC ACC TTT AGA GGC CAA TGC GAG AAG AAG

28

Q T C T F R G Q C E K K

GAC AGC TGT AAA CTC TTG CTC AGC ACGgtgggtgtctccc

40

D S C K L L L S T

aa... intron 3 = 92bp ...catcacctttctcagATC

49

I

TGC CTG GGG GAG AAA GCC AAA GAG GAG GTG AAC CGT

50

C L G E K A K E E V N R

GTG GAA GTC CTC TCC CAG GAA GGC AGA AAA CCA CCA

62

V E V L S Q E G R K P P

ATC ACT ATT GCT ACG CTG AAG GCA TCA GTC CTG CCC

74

I T I A T L K A S V L P

ATGgtgagtcttctctcc... intron 4 = 2.8kb ...agaa

86

M

gggggacacagGTC ACT GTG TCA GGT ATA GAG CTT TCT

87

V T V S G I E L S

CCT CCA GTA ACT TTT CGG CTC AGG ACT GGC TCA GGA

96

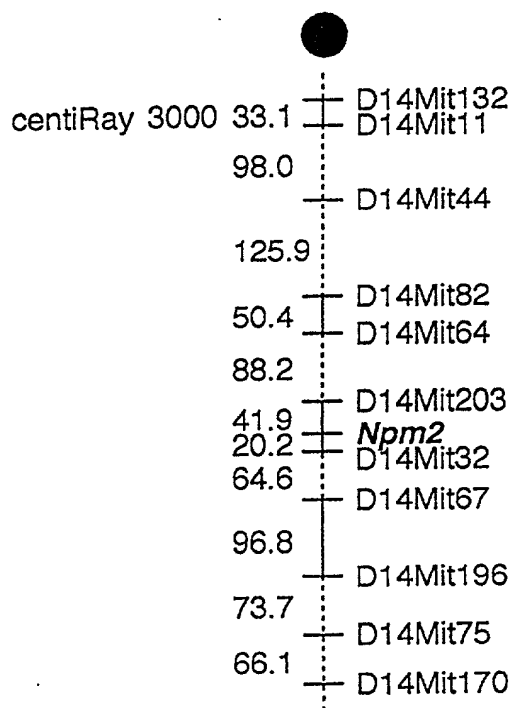
P P V T F R L R T G S G

Figure 13A

108 CCT GTG TTC CTC AGT GGC CTG GAA TGT TAT Ggtaagtt
 P V F L S G L E C Y
 gtagccta... intron 5 = 1.35kb ...ggctacccattcc
 118 agAG ACT TCG GAC CTG ACC TGG GAA GAT GAC GAG GAA
 E T S D L T W E D D E E
 130 GAG GAG GAA GAG GAG GAG GAA GAG GAT GAA GAT GAG
 E E E E E E E E D E D E
 142 GAT GCA GAT ATA TCG CTA GAG GAG ATA CCT GTC AAA
 D A D I S L E E I P V K
 154 CAA GTC AAA AGG GTG GCT CCC CAG AAG CAG ATG AGC
 Q V K R V A P Q K Q M S
 166 ATA GCA AAGgtggggggaaaagaa... intron 6 = 186bp
 I A K
 169 ...tggttttgtccagAAA AAG AAG GTG GAA AAA GAA
 K K K V E K E
 176 GAG GAT GAA ACA GTA GTG AGgtaattcatgcagtt...
 E D E T V V R
 183 intron 7 = 0.5kb ... ctattccctttccagG CCC AGC
 P S
 185 CCT CAG GAC AAG AGT CCC TGG AAG AAG gtgagcaataag
 P Q D K S P W K K
 194 aag... intron 8 = 92bp ...ctcttatctgcacagGAG
 E
 195 AAA TCT ACA CCC AGA GCA AAG AAG CCA GTG ACC AAG
 K S T P R A K K P V T K
 207 AAA TGA CCTCATCTTAGCATCTTCTGCGTCCAAGGCAGGATGTCCA
 K *
 GCAGCTGTGTTCTGGTGCAGGTGTCCAGCCCCACCACCCTAGTCTGAA
 TGTAAATAAGGTGGTGTGGCTGTAACCCTGTAACCCAGCCCTCCAGTTT
 CCGGAGGTTTTTGGTGAAGAGCCCCCAGCAAGTTTCGCCTAGGGCCACA
ATAAAATTTGCATGATCAGGacctccctctgcctccccctccctggat
 gggctcctcgctgctgcatagctcatgtgccagcagagggcaacc
 acgagcaagaaccagccccatgt

Figure 13B

T31 RH Chr 14



Haplotypes for T31 Chr 14 near Npm2

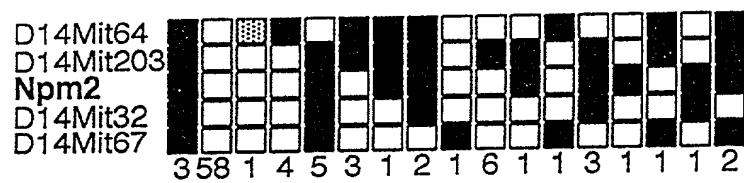


Figure 14

hNPM2	M	N	L	S	S	A	S	S	T	E	E	K	A	V	T	T	V	L	W	G	C	E	L	S	Q	E	R	R	T	W	T	F	R	P	Q	L	E	G	K	Q	40
mNpm2	M	S	R	H	S	T	S	S	V	T	E	T	A	K	N	M	L	W	G	S	E	L	N	Q	E	K	Q	T	C	T	F	R	G	Q	G	E	K	D	40		
xNpm2	M	A	S	T	V	S	N	T	S	K	L	E	K	P	V	S	L	I	W	G	C	E	L	N	E	Q	D	K	T	F	E	F	K	V	E	-	D	D	E	E	39
hNPM2	S	C	-	-	R	L	L	L	H	T	I	C	L	G	E	K	A	K	E	E	M	H	R	V	E	I	L	P	P	A	N	Q	E	D	K	K	M	Q	P	V	78
mNpm2	S	C	-	-	K	L	L	L	S	T	I	C	L	G	E	K	A	K	E	E	V	N	R	V	E	V	L	S	-	-	-	Q	E	G	R	K	-	P	P	I	74
xNpm2	K	C	E	H	Q	L	A	L	R	T	V	C	L	G	D	K	A	K	D	E	F	N	I	V	E	I	V	T	Q	E	E	G	A	E	K	S	V	P	-	-	77
hNPM2	T	I	A	S	L	Q	A	S	V	L	P	M	V	S	M	V	G	V	Q	L	S	P	P	V	T	F	Q	L	R	A	G	S	G	P	V	F	L	S	G	Q	118
mNpm2	T	I	A	T	L	K	A	S	V	L	P	M	V	T	S	G	I	E	L	S	P	P	V	T	F	R	L	R	T	G	S	G	P	V	F	L	S	G	L	114	
xNpm2	-	I	A	T	L	K	P	S	I	L	P	M	A	T	M	V	G	I	E	L	T	P	P	V	T	F	R	L	K	A	G	S	G	P	L	Y	I	S	G	Q	116
hNPM2	E	R	Y	E	A	S	D	L	T	W	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	D	D	E	D	E	D	A	D	I	S	L	E	E	Q	158	
mNpm2	E	C	Y	E	T	S	D	L	T	W	E	D	E	E	E	E	E	E	E	E	E	E	E	E	E	D	E	D	E	D	A	D	I	S	L	E	E	-	149		
xNpm2	H	V	A	M	E	E	D	Y	S	W	A	E	E	E	D	E	G	E	A	E	G	E	E	E	E	E	E	E	E	D	Q	E	S	-	-	-	-	-	-	149	
hNPM2	S	P	V	K	Q	V	K	R	L	V	P	Q	K	Q	A	S	V	A	K	K	K	K	L	E	K	E	E	E	-	-	I	R	A	S	V	R	D	K	S	196	
mNpm2	I	P	V	K	Q	V	K	R	V	A	P	Q	K	Q	M	S	I	A	K	K	K	K	V	E	K	E	E	D	E	T	V	V	R	P	S	P	Q	D	K	S	189
xNpm2	-	P	P	K	A	V	K	R	P	A	A	T	K	K	A	G	Q	A	K	K	K	L	D	K	E	D	E	-	-	-	-	-	-	-	-	-	-	-	-	-	182
hNPM2	P	V	K	K	A	K	A	T	A	R	A	K	K	P	G	F	K	K																							214
mNpm2	P	W	K	K	E	K	S	T	P	R	A	K	K	P	V	T	K	K																						207	
xNpm2	P	T	K	K	G	K	G	A	G	R	G	R	K	P	A	A	K	K																						200	

FIGURE 15

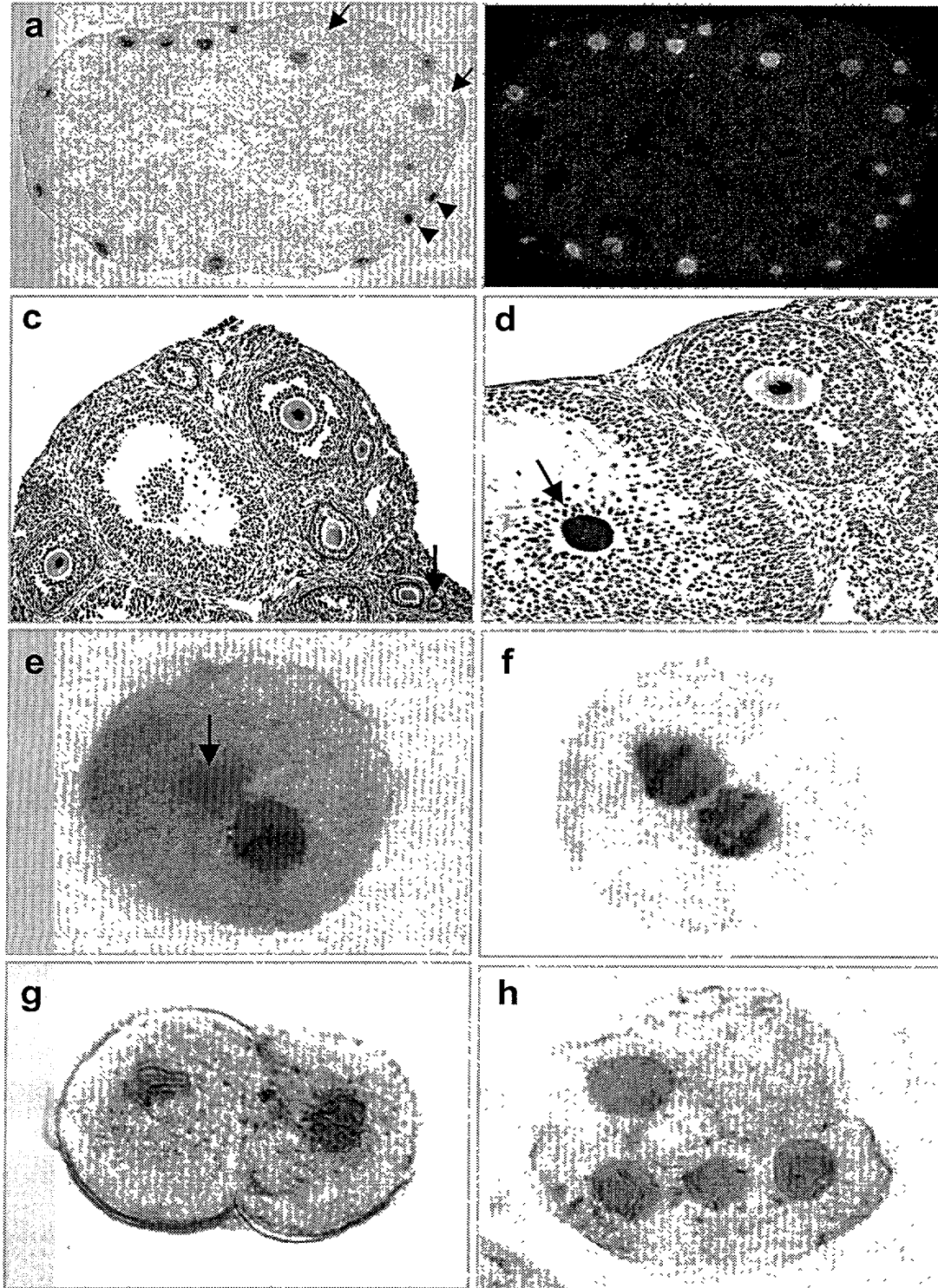


FIGURE 16

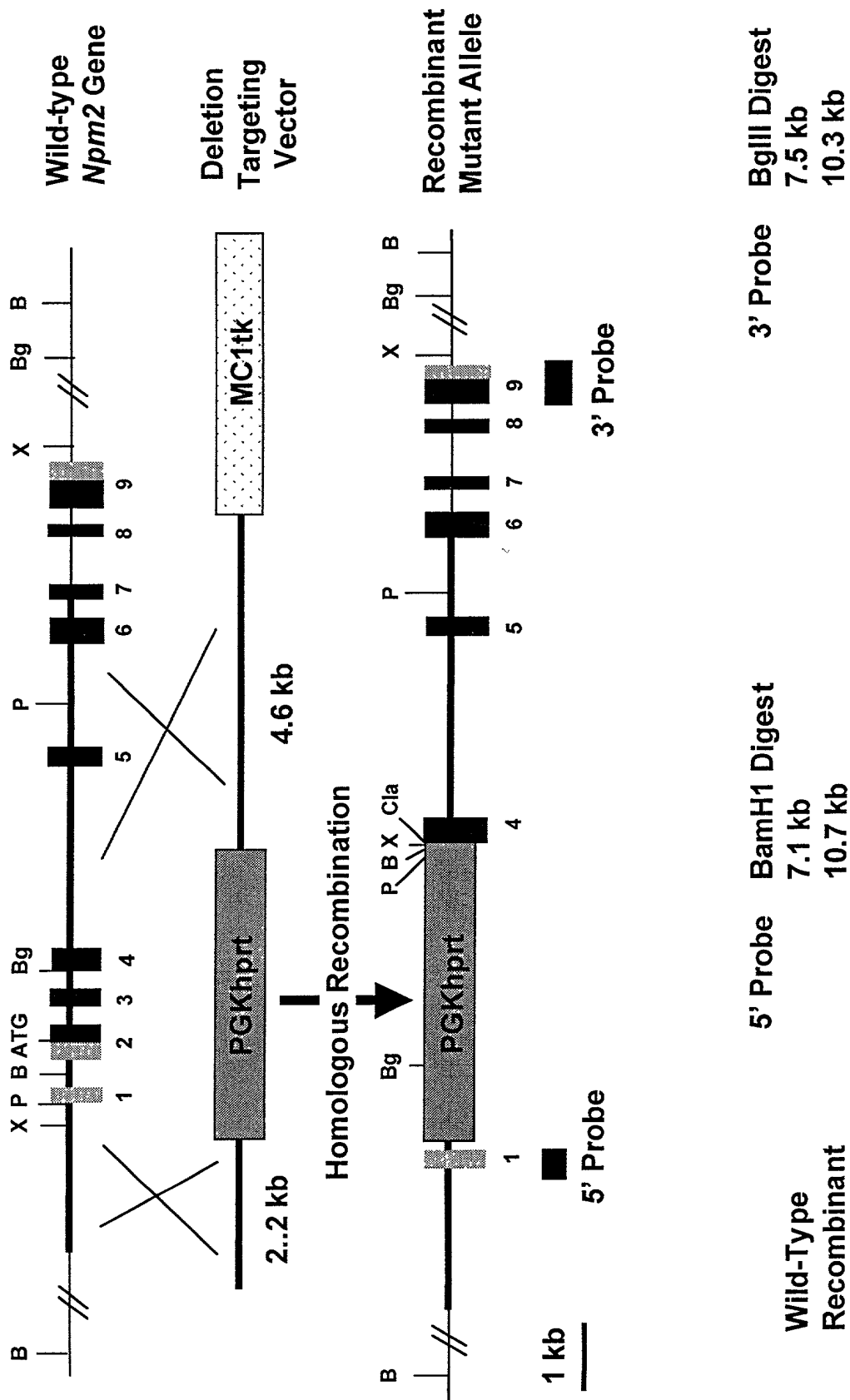


FIGURE 17a

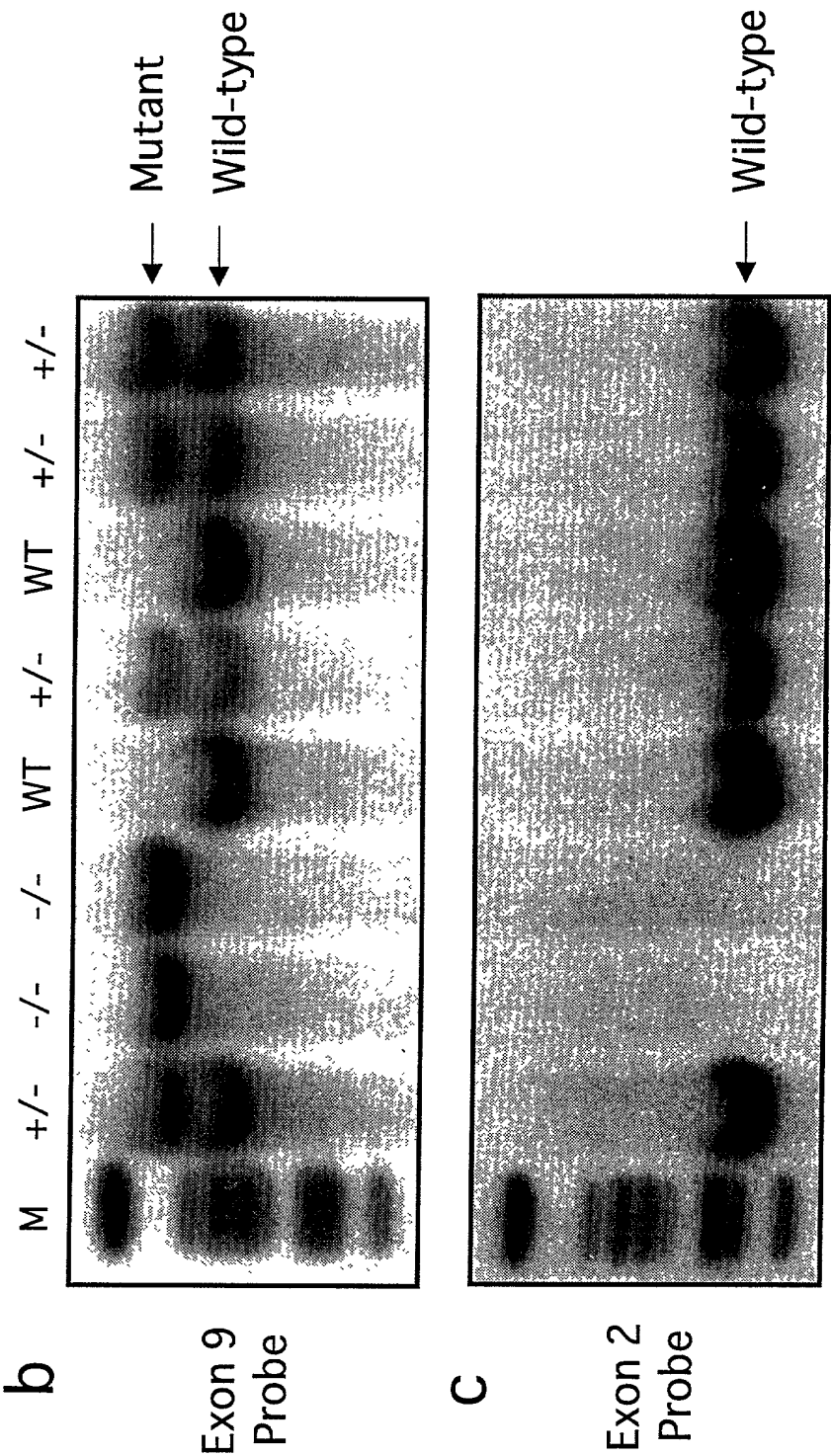


Figure 17b - Figure 17c

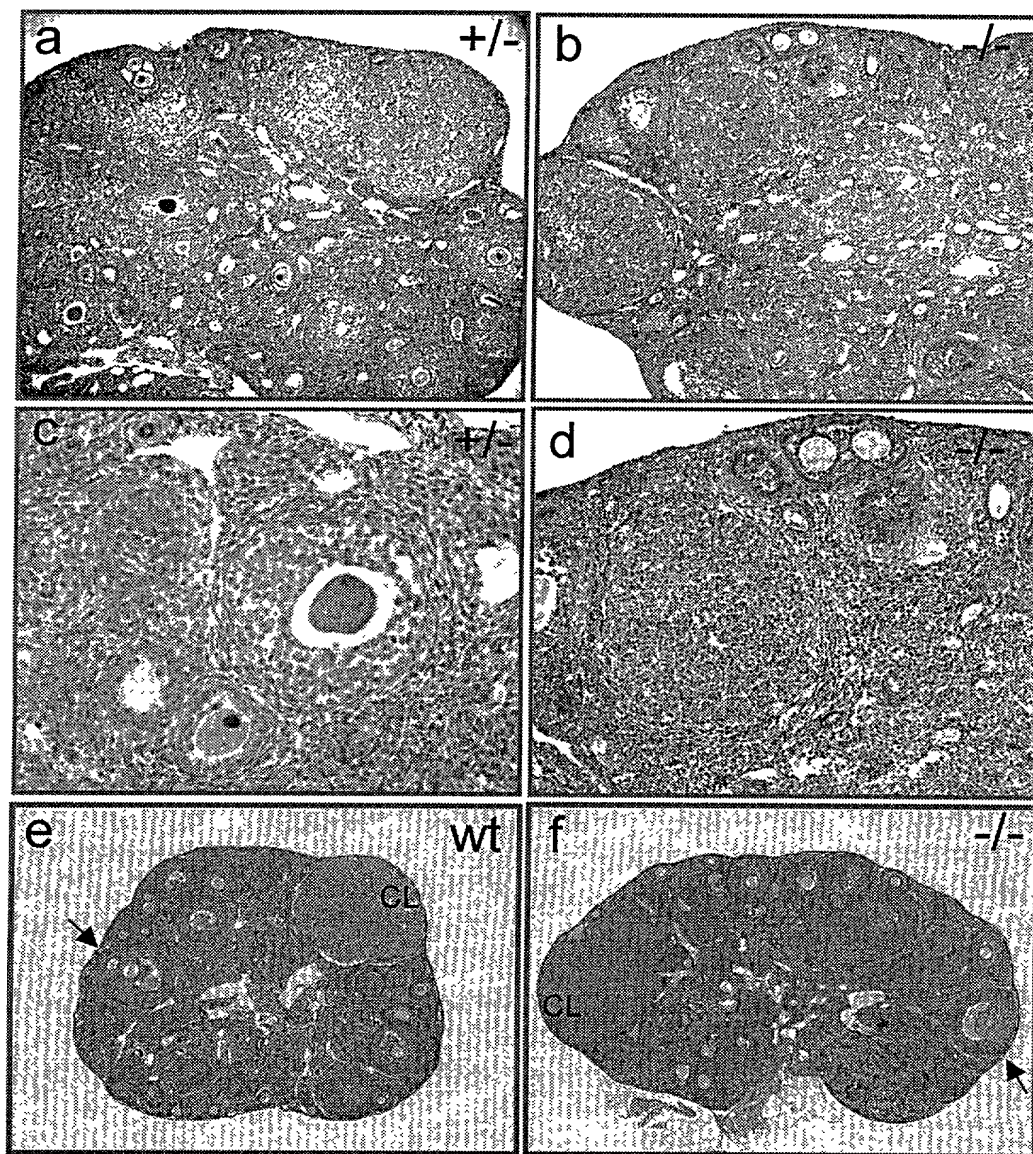


Figure 18

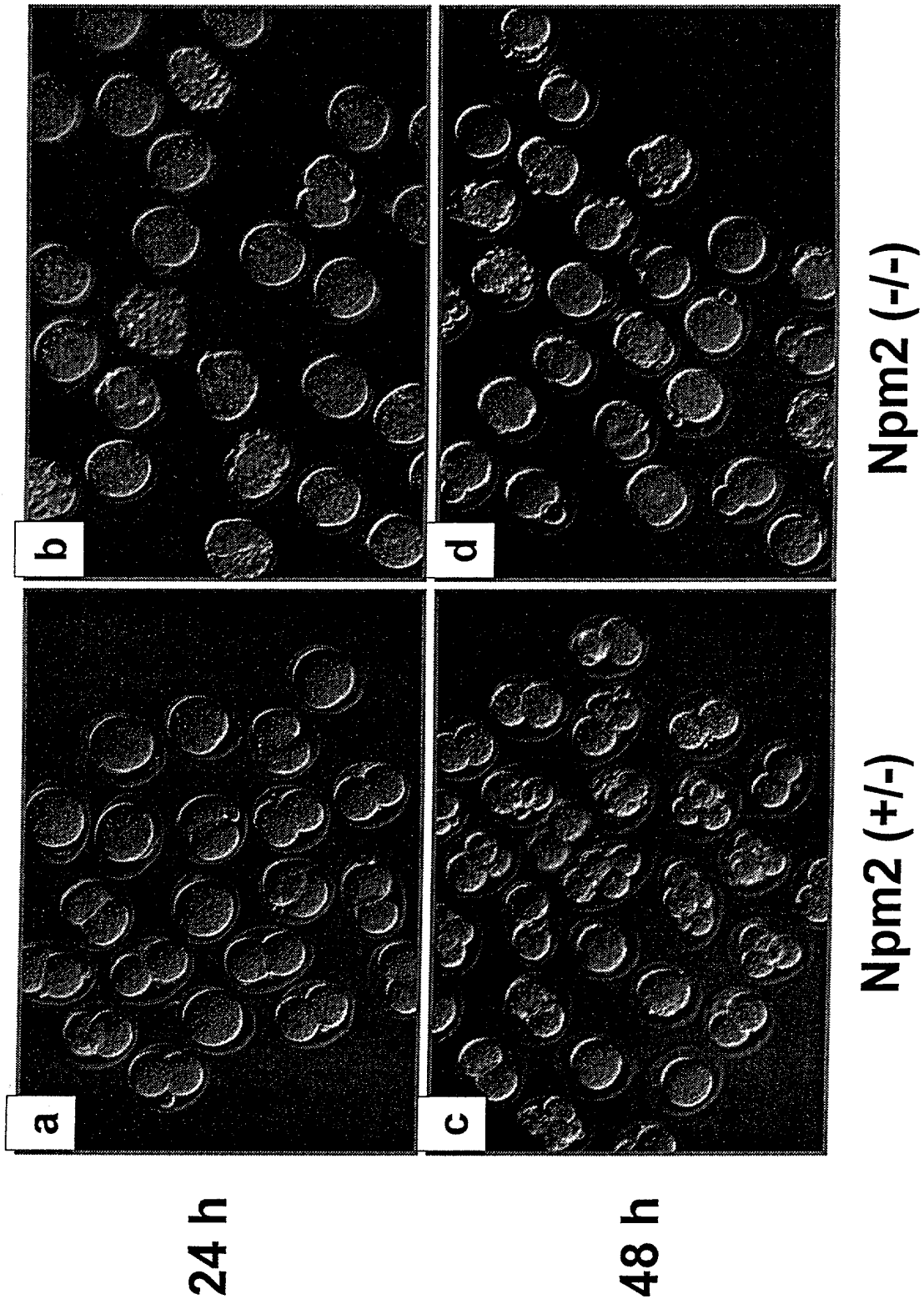


Figure 19a - 19d

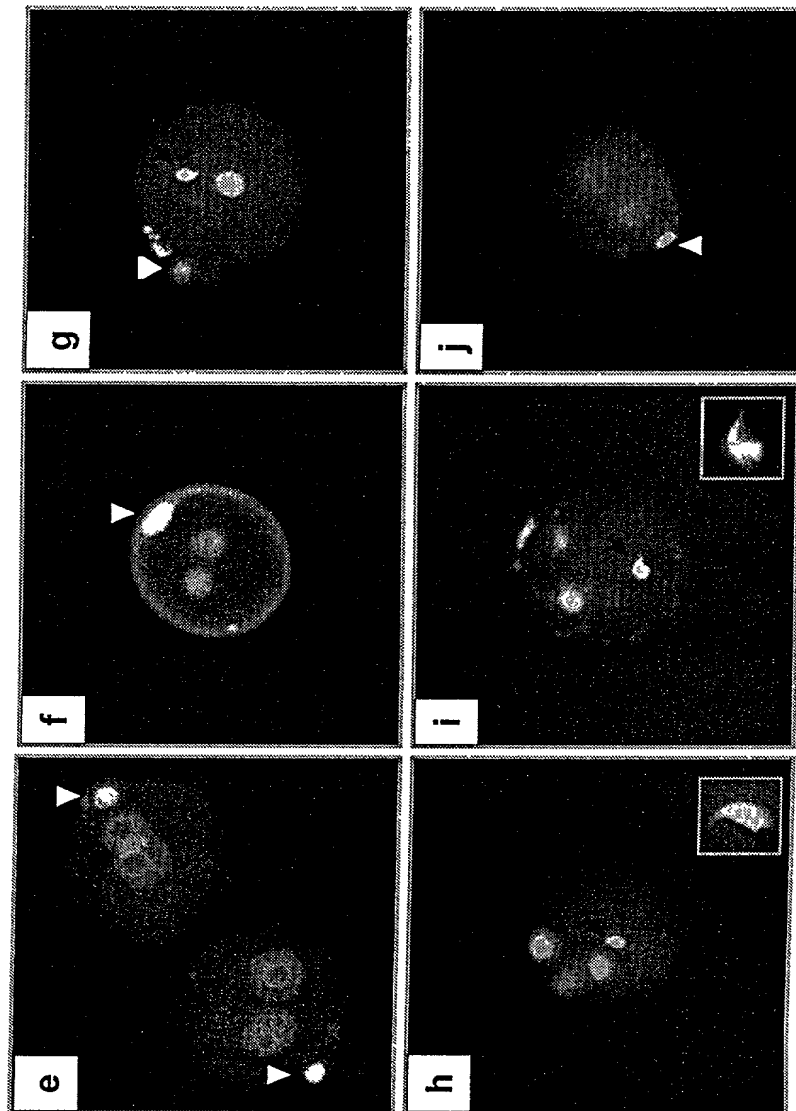


Figure 19e - 19j

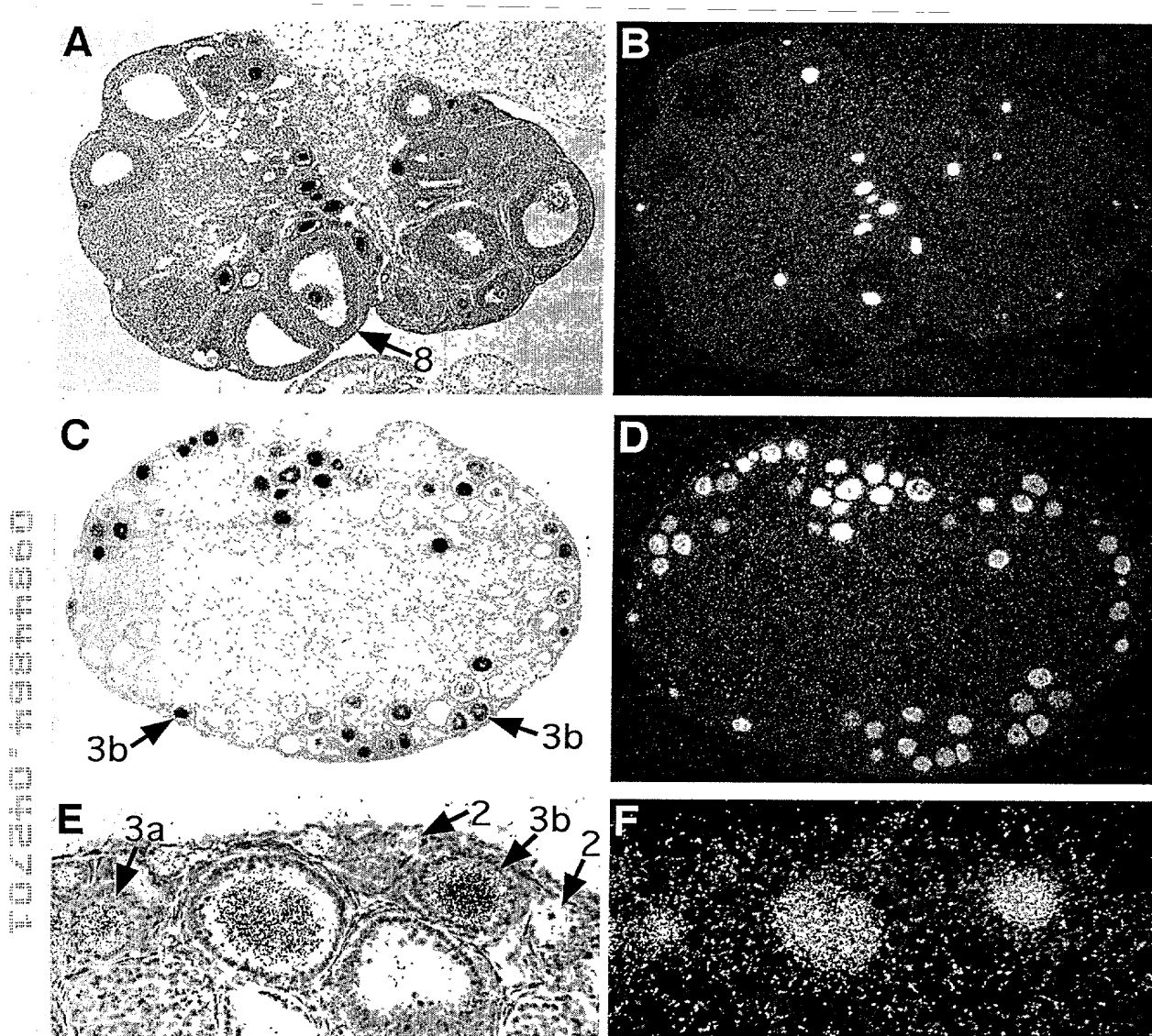


Figure 20

Oo1ps:

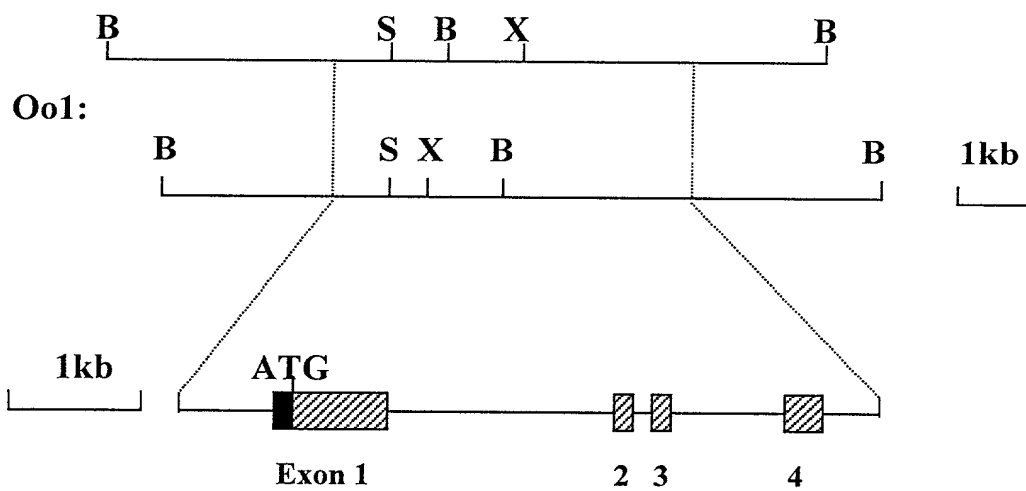


Figure 21

Oo1	gene	GGCGGGCGAGGCGCGGGACGCACCC ATG TTCCCGGCGAGCACGTTCCACCCCTGCCCGCATCCTTATCCG	70
psOo1	gene	GGCGGGCGAGGCGCGGGACGCACCCATGTTCCCGGCGAGCACGTTCCACCCCTGCCCGCATCCTTATCCG	
Oo1	gene	CAGGCCACCAAAGCCGGGGATGGCTGGAGGTTCCGAGCCAGGGGCTGCCGACCCGCGCCCCCTCCTTCC	140
psOo1	gene	CAGGCCACCAAAGCCGGGGATGGCTGGAGGTTCCGAGCCAGGGGCTGCCGACCCGCGCCCCCTCCTTCC	
Oo1	gene	TCCCCGGCTACAGACAGCTCATGGCCGGGAGTACGTCGACAGCCACCAGCGGGCACAGCTCATGGCCCT	210
psOo1	gene	TCCCCGGCTACAGACAGCTCATGGCCGGGAGTACGTCGACAGCCACCAGCGGGCACAGCTCATGGCCCT	
Oo1	gene	GCTGTGCGGATGGGTCCCCGGTCCGTCAGCAGCCGTGACGCTGCGGTGCAGGTGAACCCGCGCCGCGAC	280
psOo1	gene	GCTGTGCGGATGGGTCCCCGGTCCGTCAGCAGCCGTGACGCTGCGGTGCAGGTGAACCCGCGCCGCGAC	
Oo1	gene	GCCTCGGTGCAGTGTTCCTCGGGCGCCGACGCTGCAGCCTGCAGGGTGCCGAGCCAGCCCCGACGCCC	350
psOo1	gene	GCCTCGGTGCAGTGTTCCTCGGGCGCCGACGCTGCAGCCTGCAGGGTGCCGAGCCAGCCCCGACGCCC	
Oo1	gene	GATCGGGTTCTGTCAACCCCGTGGCCACGCCGGCGCCGGGAGATCCCCGCGATCCTGGCAGACCGTAGC	420
psOo1	gene	GGTCCGGTTCTGTCAACCCCGTGGCCACGCCGGCGCCGGGAGATCCCCGCGATCCTGGCAGACCGTAGC	
Oo1	gene	CCCGTTCTCGTCCGTGACCTTCTGTGGCTCTCCTCCTCACTGGAGGTTGCGGGAGGCAGGCAGACACCC	490
psOo1	gene	CCCGTTCTCGTCCGTGACCTTCTGTGGCTCTCCTCCTCACTGGAGGTTGCGGGAGGCAGGCAGACACCC	
Oo1	gene	ACGAAGGGAGAGGGGAGCCCGCATCTCCGGGGACCCGGAACCCGAGCCGAGAGAGGTGCCCGCGAGGA	560
psOo1	gene	ACGAAGGGAGAGGGGAGCCCGCATCTCCGGGGACCCGGAACCCGAGCCGAGAGAGGTGCCCGGTGAGGA	
Oo1	gene	AAGCGGTCCCCCAGCCGGAAGCGAGGAGGGCGATGTTTCAAGGCTGCAGGGCAGGCCGGGTGGGAGCAGCA	630
psOo1	gene	AAGCGGTCCCCCAGCCGGAAGCGAGGAGGGCGACGTTTCAAGGCTGCAGGGCAGGCCGGGTGGGAGCAGCA	
Oo1	gene	GCCACCACCGGAGGACCGGAACAGTGTGGCGCGATGCAGTCTGAGCCTGGGAGCGAGGAGCCATGTCTT	700
psOo1	gene	GCCACCACCGGAGGACCGGAACAGTGTGGCGCGATGCAGTCTGAGCCTGGGAGCGAGGAGCCATGTCTT	
Oo1	gene	GCCGAGAGATGGCTCAGGACCCCGGTGATTCCGATGCCCTCGAGACCAGGCCTCCCGCAAAGCACGG	770
psOo1	gene	GCCGAGAGATGGCTCAGGACCCCGGTGATTCCGATGCCCTC-----CCCGCAAAGCACCA	
Oo1	gene	AGCAGGACAAGGAGCGCTGCGTTTCCAGgtgagccagcctga...intron 1 (1.8kb)... taccctgc	799
psOo1	gene	AGCAGGACAAGGAGCTTCTGCGTTTCCAGgtgagccagcctgg...intron 1 (1.8kb)... taccctgc	
Oo1	gene	tggtcagTTCTTAGAGCAGAAGTACGGCTACTATCACTGCAAGGACTGCAAAATCCGGTGGGAGAGCGCCT	863
psOo1	gene	tggtcagTTCTTAGAGCAGAAGTACGGCTACTATCACTGCAAGGACTGCAAAATCCGGTGGGAGAGCGCCT	
Oo1	gene	ATGTGTGGTGTGTGTCAGGACACAGTAAGgtaagagacaccgtg...intron 2 (78bp)... tctttctct	892
psOo1	gene	ATGTGTGGTGTGTGTCAGGACACAGTAAGgtaagagacaccgtg...intron 2 (78bp)... tctttctct	
Oo1	gene	cgcagGTGTACTTCAAACAGTTCTGCCGAGTGTGTGAGAAATCCTACAACCCTTACAGAGTGGAGGACAT	957
psOo1	gene	cgtag GTGTACTTCAAACAGTTCTGCCGAGTGTGTGAGAAATCCTACAACCCTTACAGAGTGGAGGACGT	
Oo1	gene	CACCTGTCAAagtaaaccacacgttt...intron 3 (878bp)...actccgatttttcagAGTGTGTAAGGAAGT	982
psOo1	gene	CACCTGTCAAagtaaaccacacgttt...intron 3 (878bp)...gctctagttttcagAGTGTGTAAGGAAGT	

Figure 22a

Oo1 gene AGATGTGCCTGCCCAGTCAGACITGGCCACGTGGACCCTAAACGCCCCCATCGGCAAGACTTGTGTGGCA 1052
 psOo1 gene AGATGTGCCTGCCCAGTCAGACCTGGCCACGTGTACCCTTAGACGCCCCCATCAGCAAGACTTGTGTGACA

Oo1 gene GATGCAAGGACAAAATGCTTGTCTTGGACAGCACCTTCAGCTTCAAATACATCATTTAGTGAGAGTACGA 1122
 psOo1 gene GATGCAAGGACAAAAGCTTGTCTTGGACAGCACCTTCAGCTTCAAATACATGATTTAGTGAGAGTGGAA

Oo1 gene AACGTTTCTGCTAGATGGGGCTAATGGAATGGACAAGTGAGCTTTCTCCCCCTCTTCCCTCTTCCCATTTTC 1192
 psOo1 gene AACGTTTCTGCTAGATGGGGCTAATGGAATGGACAAGTGAGCTTTCTCCCCCTCTTCCCTCTTCCCTTTTC

Oo1 gene CAAATTCTTCATGACAGACAGTGTACTTGGATATAAAGCCTGTGAATAAAAGGTATTGCAAACA 1257
 psOo1 gene CAAATTCTTCATGACAGACAGTGTACTTGGATATAAAGCCTGTGAATAAAAGGTATTGCAAACA

Figure 22b

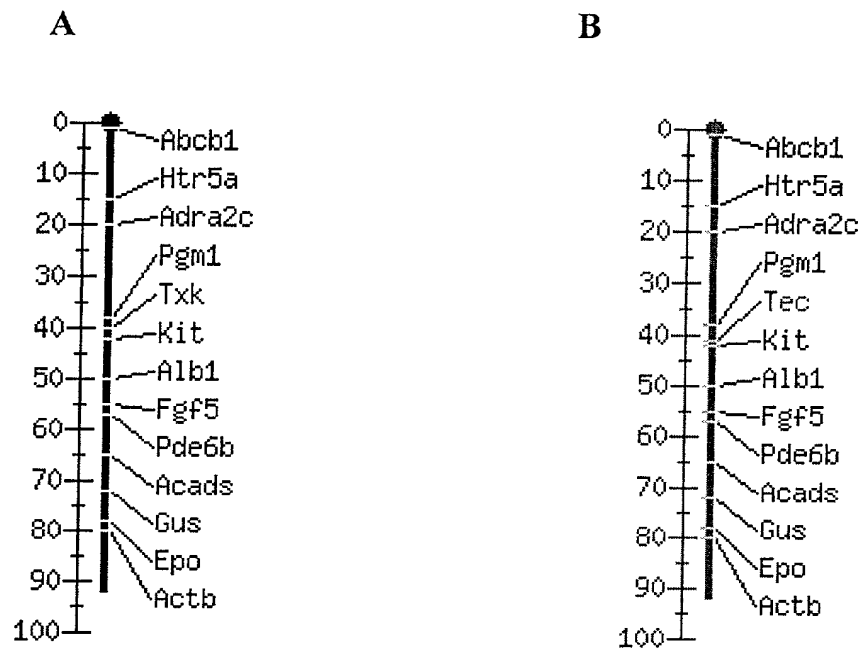


Figure 23

Oo1 Gene Targeting Strategy

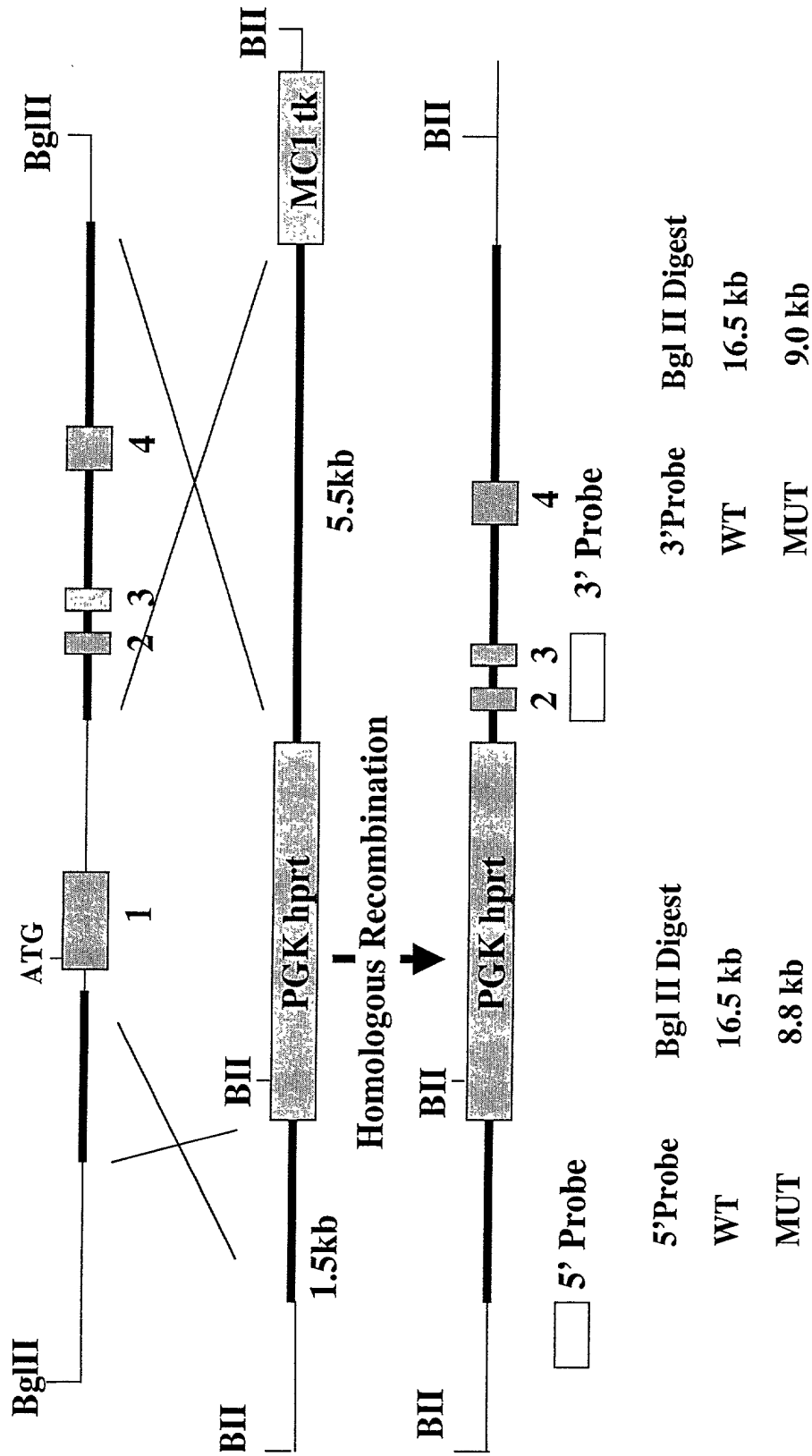


Figure 24

Human NPM2 cDNA sequence: 924bp

CAGCCCGCTT CTCTGCCCCG AGCCATGAAT CTCAGTAGCG
 CCAGTAGCAC GGAGGAAAAG GCAGTGACGA CCGTGCTCTG
 GGGCTGCGAG CTCAGTCAGG AGAGGCGGAC TTGGACCTTC
 AGACCCCAGC TGGAGGGGAA GCAGAGCTGC AGGCTGTTGC
 TTCATACGAT TTGCTTGGGG GAGAAAGCCA AAGAGGAGAT
 GCATCGCGTG GAGATCCTGC CCCCAGCAAA CCAGGAGGAC
 AAGAAGATGC AGCCGGTCAC CATTGCCTCA CTCCAGGCCT
 CAGTCCTCCC CATGGTCTCC ATGGTAGGAG TGCAGCTTTC
 TCCCCAGTT ACTTTCCAGC TCCGGGCTGG CTCAGGACCC
 GTGTTCTCA GTGGCCAGGA ACGTTATGAA GCATCAGACC
 TAACCTGGGA GGAGGAGGAG GAAGAAGAAG GGGAGGAGGA
 GGAAGAGGAA GAGGAAGATG ATGAGGATGA GGATGCAGAT
 ATATCTCTGG AGGAGCAAAG CCCTGTCAAA CAAGTCAAAA
 GGCTGGTGCC CCAGAAGCAG GCGAGCGTGG CTAAGAAAAA
 AAAGCTGGAA AAAGAAGAAG AGGAAATAAG AGCCAGCGTT
 AGAGACAAGA GCCCTGTGAA AAAGGCCAAA GCCACAGCCA
 GAGCCAAGAA GCCAGGATTC AAGAAATGAG GAGCCACGCC
 TTGGGGGGCA CGGTGCAAAG TGGGCCTTCC CTGGGCTGTG
 CTGCAGGCAC AGGGTGCCCC TGTCCAGCCC CTCCACCTGT
 GTCTGAATGC AACAGGGGTG TTGCGGGGGC AACATGAGAG
 CCCCTCACCC CCAACTCTCC ACTTTCAGGA GGCCCCCAGT
 GAAGAGCCCC ACCTCGGGGT CACAATAAAG TTGCCTGGTC
 AGGAAAAAAA AAAAAAAAAA AACGTTTGCG GCCGCAAGCT
 TATG

Human NPM2 Amino Acid sequence: 214aa

MNLSSASSTE EKAVTTVLWG CELSQERRTW TFRPQLEGKQ
 SCRLLLHTIC LGEKAKEEMH RVEILPPANQ EDKKMQPVTI
 ASLQASVLPV VSMVGVQLSP PVTFLRAGS GPVFLSGQER
 YEASDLTWEE EEEEEEEEEEE EEEEDDEDDED ADISLEEQSP
 VKQVKRLVPQ KQASVAKKKK LEKEEEEIRA SVRDKSPVKK
 AKATARAKKP GFKK

Figure 25